5.0 NATURE AND EXTENT OF CHEMICAL CONSTITUENTS EXCEEDING REGULATORY CRITERIA

The following sections describe the analytical results for soil and groundwater samples collected during the RI field work conducted from March 27, 2003 through September 26, 2003. The results are organized by relative portion of the Site where samples were collected. Tables are provided that present the relevant soil and groundwater data and applicable Model Toxic Control Act (MTCA) cleanup criteria or National Water Quality Criteria, as appropriate. The complete analytical data reports for RI samples including the Ecology split samples are provided in Appendix H.

Method A and B cleanup criteria and ecological concern criteria (for simplified terrestrial ecological evaluations) are provided with the constituents or compounds results for soil samples, as appropriate. Method A and B cleanup criteria for groundwater and surface water with respect to human health are provided with the constituents or compounds results for groundwater samples, as appropriate. MTCA Method A criteria are conservative cleanup levels for sites undergoing routine cleanup actions or sites with relatively few hazardous substances. The Method A cleanup criteria are protective of human health and the environment for unrestrictive land use and potable water. MTCA Method B criteria presented are risk-based cleanup numbers that are protective of human health and the environment for unrestricted land use, potable water and surface water for a wide variety of hazardous substances. Chapter 173-201A 040 WAC surface water criteria and National Water Quality Criteria (EPA, 2002) for surface water are provided on groundwater tables for aquatic concerns, as appropriate. A more complete discussion of risk-based cleanup criteria and remedial action objectives is provided in Section 7.

Based on historical information those chemicals that may potentially have been contained in Site soils or groundwater and posed a risk to human health or the environment were considered as Constituents of Potential Concern (COPCs). Those constituents detected in soil or groundwater samples that were reported above their respective practical quantitation limit (PQL) and exceeded their respective cleanup criteria under MTCA or were not detected above their PQL, but the PQL exceeded the MTCA cleanup criteria were retained as COPCs. The list of COPCs was subsequently evaluated to determine the Constituents of Concern (COC) for soil and groundwater for each portion of the Site.

In general, COPCs were identified as COCs if the reported concentration for a constituent exceeded the applicable MTCA cleanup criteria. Uncertainties or exceptions that affected the determination of COCs from the list of COPC during the evaluation are presented in Section 5.6.2. Those constituents detected in soil or groundwater samples are identified in Section 5 tables. The tables also identify the constituents that exceeded MTCA cleanup criteria or had PQLs above the cleanup criteria (COCs). Figure 5-1 presents the concentrations of COCs and identifies the areas where Site soil is impacted with COCs above cleanup criteria.

5.1 East Portion Summary of Soil and Groundwater Sample Results

Tables 5-1.1 through 5-1.4 summarize the analytical results for soil and groundwater samples associated with the East Portion of the Site. Table 5-1 presents the analytical results for soil samples analyzed for total petroleum hydrocarbons and lead. Tables 5-1.2 through 5-1.4 present the groundwater sample analytical results for total petroleum hydrocarbons, lead, arsenic, polynuclear aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs) detected above the respective VOC PQLs. Based on the results presented in the respective tables and following discussion diesel range petroleum hydrocarbons are identified as a COC for soil on the East Portion

of the Site. Diesel and gasoline range petroleum hydrocarbons are identified as COCs for groundwater on the East Portion of the Site.

5.1.1 Soil

Table 5-1.1 summarizes the analytical soil results for the soils associated with potential releases from former diesel and waste oil USTs on the East Portion of the Site. The analytical results show that petroleum hydrocarbons were not present in the soil samples above their respective PQLs in RI samples with only one exception. Oil range petroleum hydrocarbons were detected (550 mg/kg) in one sample collected from GeoProbe sample location GP-01 at approximately 2.5 feet bgs, which at the reported concentration do not exceed the MTCA ecological concerns, or Method A or Method B cleanup criteria. However, diesel range petroleum hydrocarbons were detected (24,000 mg/kg) during the 1992 Century West investigation that exceeded the MTCA cleanup criteria in the sample that was colleted from CW-TP-2. The test pit was east of the maintenance shop wash rack as shown in Figure 5-1. The soils may have not been completely removed. Therefore, diesel through oil range petroleum hydrocarbons are identified as a COC for the East Portion of the Site soil.

5.1.2 Groundwater

Groundwater samples collected in East Portion of the Site showed little evidence of remaining impacts from historical UST releases of petroleum hydrocarbons with only one exception. A four to six inch floating petroleum product layer (diesel fuel) was discovered in MW-11 during the RI. The only groundwater sample collected on the East Portion of the Site that exhibited petroleum hydrocarbons concentrations above the MTCA Method A cleanup criteria was collected below the product layer at MW-11 Neither the product layer nor dissolved petroleum hydrocarbons were detected within 15 feet of MW-11 in hydraulically down-gradient or cross-gradient sample locations. Groundwater outside of the immediate area in the area of MW-11 does not appear to be impacted above cleanup criteria, however, only soil has been tested up-gradient of MW-11. The concentrations of diesel range petroleum hydrocarbons detected in MW-11 groundwater sample may be a function of intra well contamination between the floating product and groundwater or more closely associated with lowering the groundwater sampling pump through the product layer to collect the sample. Diesel through oil range petroleum hydrocarbons are identified as a COC for the East Portion of the Site groundwater. However, the floating product at MW-11 will essentially be addressed as a soil and source removal issue with subsequent groundwater testing. There are no surface water criteria for aquatic concerns available for petroleum hydrocarbons or associated VOC constituents from the noted sources.

PCBs were not detected above the individual aroclor PQLs (0.047 µg/L) and are not considered a COC. However, the PQL for PCBs does exceed the National Water Quality Criteria (0.014µg/L). A further discussion of PCB concentrations and National Water Quality Criteria is provided in Section 5.6.2.

Arsenic was detected in the five groundwater samples collected from the East Portion of the Site in March 2003. Concentrations ranged from 4.3 to 9.3 µg/L and exceeded the MTCA Method A cleanup criteria (5 µg/L) in four of the five samples. Arsenic was also detected in the six groundwater samples and one duplicate sample collected from the East Portion of the Site in September 2003. Concentrations ranged from 4.6 to 9.4 µg/L and exceed the MTCA Method A cleanup criteria (5 µg/L) in six of the seven samples. A final groundwater sample was collected from MW-02 on December 9, 2003 and had a concentration of 5.2 µg/L, which again exceeds the MTCA Method A cleanup criteria. However, based on statistical analysis conducted in accordance with WAC 173-340-709, the concentrations of arsenic detected in groundwater from two hydraulically

upgradient well locations (MW-02 and MW-15) indicate the area background "upper 90" percentile concentration for arsenic in groundwater is 9.9 µg/L. Therefore, the arsenic concentrations detected in the East Portion of the Site groundwater samples are consistent with the calculated area background concentration.

Therefore, arsenic is not considered a COC in the East Portion of the Site. A further discussion of arsenic and background concentrations is provided in Section 5.6.2. Arsenic concentrations were below the surface water criteria for aquatic concerns.

Twelve of 18 PAHs were detected in the MW-11 groundwater sample. Two of the PAHs benzo(a)anthracene and chrysene are carcinogenic PAHs (cPAHs). The analytical results show that the concentrations of PAHs including the cPAHs are not above the MTCA Method A and B cleanup criteria. There are no surface water criteria for aquatic concerns available for PAHs from the noted sources. PAHs are not considered a COC in the groundwater in the East Portion of the Site.

A total of 12 VOCs were detected in RI groundwater samples collected from monitoring wells located on the East Portion of the Site. Ecology had a split sample from MW-11 analyzed for VOCs at their laboratory in Manchester, Washington. The analytical results from Ecology split samples produced results consistent with the RI samples. Four additional VOCs were detected above their respective PQLs in the Ecology split sample than the RI samples. No more than six individual compounds were detected in any one individual RI sample. A total of 16 VOCs were reported as detected in the split sample. The analytical results show that the concentrations of VOCs are not above the MTCA Method A or Method B cleanup criteria in either the RI or split samples. There are no surface water criteria for aquatic concerns available for the detected VOCs from the noted sources. Therefore, VOCs are not considered a COC for groundwater on the East Portion of the Site.

5.2 Central Portion Summary of Soil and Groundwater Sample Results

Tables 5-2.1 through 5-2.4 summarize the analytical results for soil samples associated with the source area in the Central Portion of the Site. Table 5-2.2 present the analytical results for total petroleum hydrocarbons used to delineate the extent of petroleum hydrocarbon impacts in the Central Portion of the Site. Table 5-2.5 present the analytical results for groundwater samples analyzed for total petroleum hydrocarbons, lead, arsenic, and PAHs. VOCs detected above the VOC PQLs are presented on Table 5-2.6. Table 5-2.7 present the analytical results for soil samples analyzed for total organic carbons. Based on the results presented in the respective tables and following discussion, diesel, oil and gasoline range petroleum hydrocarbons, xylenes and lead are identified as COCs for soil on the Central Portion of the Site.

5.2.1 Soil

Table 5-2.1 summarizes the petroleum hydrocarbon, BTEX, MTBE, PCB and lead results for the soils associated with the source area on the Central Portion of the Site. Table 5-2.2 summarizes the petroleum hydrocarbon, BTEX, MTBE results for soil samples collected and analyzed to delineate the extent of impacted soils.

Sample results from TP-04, and TP-05, show diesel, oil and gasoline range petroleum hydrocarbons were detected above both the MTCA Method A and ecological concern cleanup criteria in the source area and extended south-southeast to the area near GP-09 and GP-10. Ecology collected split samples from TP-04 and TP-05 that were analyzed at its Manchester laboratory. The analytical results from Ecology split samples produced results consistent with the RI samples. Diesel and or oil range petroleum hydrocarbons were also detected in soil samples collected from GP-07, GP-08, GP-11,

GP-14, GP-15 and MW-15 but were below the MTCA Method A and ecological concerns cleanup criteria. Gasoline range petroleum hydrocarbons were only detected in samples collected from TP-04, TP-05, MW-16 and GP-09.

Lead was only detected in concentrations above the MTCA Method A cleanup criteria for unrestricted use in samples collected from TP-05. Lead was detected in concentrations ranging from 7.5 mg/kg to 330 mg/kg in the source area soil samples. The lead concentrations did not exceed the MTCA Method A cleanup criteria for industrial use (1,000 mg/kg) but did exceed the MTCA Method A cleanup criteria for unrestricted use (250 mg/kg), and exceeded the 220 mg/kg MTCA Ecological Concern Criteria (WAC 173-340 Table 749-2) in samples collected from TP-05. Therefore, lead is retained as a COC for some soil in the Central Portion of the Site.

Diesel and oil range petroleum hydrocarbons were detected in the Central Portion soil samples at concentrations that ranged between 170 mg/kg to 12,000 mg/kg and 67 mg to 8,700 mg/kg, respectively. Gasoline petroleum hydrocarbons were detected in soil samples at concentrations that ranged between 50 mg/kg to 5,800 mg/kg. Split sample results for diesel and oil range petroleum hydrocarbons were similar to the RI sample results. The Manchester laboratory also reported 84 mg/kg mineral spirits range petroleum hydrocarbons in the split sample.

Aroclor 1254 (PCBs) was detected from soil samples collected from TP-05 and MW-16 but did not exceed the MTCA Method A, Method B or ecological concerns cleanup criteria. PCBs are not considered a COC for soil in the Central Portion of the Site.

PAH results for the soils associated with the source area on this portion of the Site are summarized in Table 5-2.3 Fifteen of 18 PAHs were detected in one or more of the source area soil samples. The analytical results show that the concentrations of PAHs including cPAHs are not above the MTCA Method A, Method B or ecological concern cleanup criteria. However, due to interferences from elevated concentrations of petroleum hydrocarbons, the PQLs for the primary sample and duplicate (0TP05 – 3.0, 3.9 Comp and 1TP05 – 3.0, 3.9 Comp, respectively) samples collected at test pit TP-05 were above the cleanup criteria. PAHs were not analyzed for samples collected to delineate impacted soil as they were not identified as a COC in the source area.

VOC results for the soils associated with the source area are summarized in Table 5-2.4. Nineteen of 68 VOCs analyzed were detected in one or more of the source area soil samples analyzed by EPA Method 8260B. VOCs covered by the NWTPH-Gx method include BTEX and MTBE. The analytical results show that at the concentrations individual VOCs were detected only total xylenes were detected above the MTCA Method A, Method B or ecological concern cleanup criteria. Total xylenes (sum of m, p- xylene and o-xylene) were detected above the MTCA Method A cleanup criteria in the primary sample (10.4 mg/kg) and duplicate sample (43 mg/kg) collected from GP-09 at 3.5 to 4 feet bgs. Xylenes are a constituent of gasoline and diesel fuel and can be expected to be associated with the contamination at GP-09. Xylene is a COC for some soil in the Central Portion of the Site.

5.2.2 Groundwater

Table 5-2.5 summarizes results from the analyses conducted on groundwater samples collected from the Central Portion of the Site. The RI and Ecology split sample results show that MTBE and chloroform were the only organic constituents (including petroleum hydrocarbons and PCB analyses) detected above their respective PQLs. Neither of the compounds exceeded their respective MTCA Method A or Method B cleanup criteria. There are no surface water criteria for aquatic concerns available for petroleum hydrocarbons or detected VOC constituents available from the noted sources.

Based on the analytical results PCBs are also not considered a COC. However, the PQLs (0.048 µg/L) for PCBs exceeded the National Water Quality Criteria (0.014 µg/L). A further discussion of PCB concentrations and National Water Quality Criteria is provided in Section 5.6.2.

Arsenic was detected, in the groundwater sample and duplicate sample collected from MW-16 in March 2003, at concentrations (4.7 µg/L and 5.4 µg/L) consistent with Site background levels. However the concentration detected in the original sample (5.4 µg/L) is above the MTCA Method A cleanup criteria (5.0 µg/L).

Arsenic was also detected in the four groundwater samples collected from the Central Portion of the Site in September 2003. Concentrations ranged from 6.0 to 10.0 µg/L and exceed the MTCA Method A cleanup criteria (5 µg/L). A final groundwater sample was collected in the Central Portion of the Site from MW-15 on December 9, 2003, and had a concentration of 8.5 µg/L, which again exceeds the MTCA Method A cleanup criteria.

However, based on statistical analysis conducted in accordance with WAC 173-340-709, the concentrations of arsenic detected in groundwater from two hydraulically upgradient well locations (MW-02 and MW-15) indicate the area background "upper 90" percentile concentration for arsenic in groundwater is 9.9 µg/L. Therefore, the arsenic concentrations detected in the Central Portion of the Site groundwater samples are consistent with the calculated area background concentration.

Therefore arsenic is not considered a COC in the Central Portion of the Site. A further discussion of arsenic and area background concentrations is provided in Section 5.6.2. Arsenic concentrations were below the surface water criteria for aquatic concerns.

5.3 West Portion Summary of Soil and Groundwater Sample Results

Tables 5-3.1 and 5-3.2 summarize the analytical results for soil samples analyzed in association with the West Portion of the Site. Tables 5-3.3 presents the analytical results for total petroleum hydrocarbons, PCBs, EDB and detected VOCs, and Table 5-3.4 presents the metals results for groundwater samples collected on this portion of the Site. Based on the results presented in the respective tables and following discussion, no COCs were identified for the West Portion of the Site.

5.3.1 Soil

Table 5-3.1 summarizes the petroleum hydrocarbons, BTEX, and MTBE results for the West Portion soil samples. Oil range petroleum hydrocarbons were detected above PQLs in GP-17 through GP-20 soil samples. The concentration of oil range petroleum hydrocarbons detected on this portion of the Site ranged from 74 mg/kg to 920 mg/kg. Gasoline range petroleum hydrocarbons were only detected above PQLs in the soil samples collected from GP-17 at concentrations of 6.4 mg/kg. BTEX constituents and MTBE were not detected above their respective PQLs in the Western Portion soil samples submitted for chemical analysis. At the concentrations reported neither oil nor gasoline range petroleum hydrocarbons exceed MTCA Method A or Method B cleanup or ecological concern criteria.

Table 5-3.2 summarizes the results of the RCRA metals analysis for soil samples associated with this portion of the Site. Of the soil samples analyzed from this portion of the site barium, chromium and lead were the only metals detected above their respective PQLs. None of the metals were detected above MTCA Method A or Method B cleanup or ecological concern criteria. Selenium was included in the constituents that were not detected above its PQL and is not considered a COC. However, the

PQL for selenium exceeded the ecological concern criteria of 0.8 mg/kg. A further discussion of selenium concentrations and ecological concern criteria is provided in Section 5.6.2.

5.3.2 Groundwater

Results from analysis of organic constituents conducted on groundwater samples collected from the Central Portion of the Site are summarized in Table 5-3.3. Samples were analyzed for petroleum hydrocarbons, PCBs, VOCs, and PAHs. The results show that MTBE and chloroform were the only organic constituents/compounds detected above their respective PQLs in both the RI and Ecology split samples. Neither compound exceeded MTCA Method A or Method B cleanup criteria. There are no surface water criteria for aquatic concerns available for petroleum hydrocarbons, associated VOC constituents or PAHs from the noted sources.

Based on the analytical results PCBs are also not considered a COC. However, the PQLs (0.048 µg/L) for PCBs exceeded the National Water Quality Criteria (0.014 µg/L). A further discussion of PCB concentrations and National Water Quality Criteria is provided in Section 5.6.2.

Results from analysis of RCRA metals conducted on groundwater samples collected from the Central Portion of the Site are summarized in Table 5-3.4. The results show that arsenic was the only constituent detected above its PQLs. Concentrations of arsenic in groundwater collected from GP-19, GP-22 and GP-23 ranged from 5.8 to 11 mg/L and exceed the MTCA Method A cleanup criteria (5.0 µg/L). However, based on statistical analysis conducted in accordance with WAC 173-340-709 the concentrations of arsenic detected within these samples appear to generally be within the "upper 90th percentile" (9.9 µg/L) of the area background concentration, with one exception.

The concentration of arsenic detected in groundwater samples collected from the West Portion of the Site are samples are basically consistent with the calculated area background concentration. However, the groundwater sample collected from Geoprobe location GP-23 was reported with a concentration of 11 µg/L. This is the only location on the West Portion of the Site where arsenic was detected over the calculated area background concentration. However, the groundwater samples collected from GeoProbe samples are only considered as screening level samples, since GeoProbes are not viewed as proper groundwater quality monitoring locations (i.e. a formal monitoring well installed in accordance with the WAC 173-160 "Minimum Standards for Construction and Maintenance of Wells"). Therefore, arsenic is not considered a COC in the West Portion of the Site. A further discussion of arsenic and background concentrations is provided in Section 5.6.2. Arsenic concentrations were below the surface water criteria for aquatic concerns.

Selenium and silver were included in the constituents that were not detected above their PQLs (5.6 µg/L and 11.0 µg/L, respectively). Selenium and silver were also not detected above their Method Detection Limits (MDLs) (5 µg/L and 3.1 µg/L respectively). The PQLs for selenium and silver exceeded the National Water Quality Criteria 5 µg/L and 3.2 µg/L respectively. However the sample MDL did not exceed the National Water Quality Criteria for these two analytes, therefore selenium and silver are not considered COCs. Cadmium was also included in the constituents that were not detected above its PQL (4.4 µg/L). Cadmium was also not detected above its MDL (0.56 µg/L). Cadmium MDL is only slightly above the National Water Quality Criteria (0.25 µg/L). Cadmium is not considered a COC for the Site. A further discussion of cadmium concentrations and the National Water Quality is provided in Section 5.6.2.

5.4 West Portion Catch Basin Summary of Sediment Water Sample Results

Sediment and groundwater samples were collected from the catch basin of the West Portion of the Site (Figures 2-2 and 3-2). The catch basin receives water drained from the Central and West Portions of the Site. The sediment and water samples were collected and analyzed as a screening tool to identify COPCs potentially moving from Site soil to the Site surface water and/or groundwater. Tables 5-4.1 through 5-4.3 summarize the analytical results for the sediment sample analyzed in association with the West Portion of the Site catch basin. Tables 5-4.4 through 5-4.6 present the analytical results for the water sample collected from the catch basin. Based on the results presented in the respective tables and following discussion, arsenic, selenium, cadmium and lube oil range petroleum hydrocarbons were identified as COPCs. The evaluations for sediment samples used soil cleanup criteria for evaluating the potential of a constituent to be considered as a COC.

5.4.1 Catch Basin Sediment

Table 5-4.1 summarizes the petroleum hydrocarbons, and PCB results for the catch basin sediment sample. The results show that lube oil range petroleum hydrocarbons were the only constituent detected (13,000 mg/kg) above MTCA Method A cleanup criteria (2,000 mg/kg) for soil. The presence of lube oil in the catch basin sediment is expected and does not indicate any COPC or COC not already addressed on the Site. Lube oil was identified as a COC for the Central Portion of the Site. Lube oil was also detected in soil samples collected on the West Portion but were below the soil cleanup criteria.

PAH results for the soils associated with the catch basin are summarized in Table 5-4.2. Sixteen of 18 PAHs were detected in the sediment sample. The analytical results show that the concentrations of PAHs including cPAHs are not above the MTCA Method A, Method B or ecological concern cleanup criteria of soil.

Table 5-4.3 summarizes the results of the RCRA metals analysis for the catch basin. Barium, cadmium, chromium and lead were the only metals detected above their respective PQLs. None of the metals were detected above MTCA Method A or Method B cleanup or ecological concern criteria except cadmium. Cadmium was detected at 3.1 mg/kg, which is above the MTCA Method A cleanup level (2 mg/kg) for unrestricted use. Other analysis conducted for RCRA metals in soil failed to detect cadmium above cleanup criteria. Cadmium is not considered a Site COC, as the cadmium is limited to sediments contained in the catch basin and the cleanup level is based on the protection of groundwater. Due to the presence of cadmium above the MTCA Method A cleanup level (2 mg/kg) for soil, the catch basin will be cleaned out and documented under the Site remedial actions.

Selenium was included in the constituents that were not detected above its PQL and is not considered a COC. The PQL for selenium does exceed the ecological concern criteria of 0.8 mg/kg. A further discussion of selenium concentrations and ecological concern criteria is provided in Section 5.6.2.

5.4.2 Catch Basin Water

Table 5-4.4 summarizes the petroleum hydrocarbons results for the catch basin water sample. The results show that gasoline through lube oil range petroleum hydrocarbons were not detected above the MTCA Method A cleanup criteria for groundwater or the MTCA Method B criteria for Surface Water. The water results indicate that if the lube oil detected in the sediment sample is leaching out into the water it is below detectable levels. No surface water criteria for aquatic concerns are available for petroleum hydrocarbons.

Detected VOC results associated with the catch basin water sample are summarized in Table 5-4.5. Three VOCs MTBE (0.51 µg/L), 2-butanone (80.0 µg/L) and chloroform (0.58 µg/L) were detected above PQLs. The analytical results show that the concentrations detected none of the VOCs are above the MTCA Method A cleanup criteria for groundwater or MTCA Method B criteria for surface water. No surface water criteria for aquatic concerns are available for the detected VOC constituents.

Results from analysis of RCRA metals conducted on the catch basin water sample are summarized in Table 5-4.6. The results show that arsenic was the only constituent detected above its PQLs. The concentration of arsenic in the water was reported at 6.1 µg/L and exceeds the MTCA Method A cleanup criteria (5.0 µg/L). However, based on statistical analysis conducted in accordance with WAC 173-340-709 the concentrations of arsenic detected in this sample appears to be within the calculated area background concentrations. Therefore, arsenic is not considered a COC in the West Portion of the Site. A further discussion of arsenic and background concentrations is provided in Section 5.6.2. Arsenic concentrations were below the surface water criteria for aquatic concerns.

The same RCRA metals, cadmium, selenium and silver that were not detected in the West Portion groundwater samples were also not detected above their PQLs or MDLs in the catch basin sample. The MDLs for selenium and silver (5 µg/L and 3.1 µg/L, respectively) did not exceed the National Water Quality Criteria (5.0 µg/L and 3.2 µg/L, respectively) and they are not considered COCs. Although the MDL (0.56 µg/L) for cadmium slightly exceeded the National Water Quality Criteria (0.25 µg/L), it is not considered a COC.

5.5 Site Ecological Evaluation Results

A simplified terrestrial ecological risk assessment was conducted for the City of Moses Lake RI/FS per WAC 173-340-7490 through WAC 173-340-7494. The complete ecological risk assessment is provided in Appendix C. The primary conclusions reached by the ecological evaluation are as follows:

- Currently groundwater monitoring results indicate that COCs have not migrated off-site and there is minimal potential for off-site ecological impacts associated with the Site;
- The potential for future off-site ecological impacts is low and proposed remediation alternative will remove the source of contamination on-site to below MTCA soil cleanup levels for unrestricted use as well as reduce the potential for future offsite ecological impacts to occur;
- Currently the ecological risk (to wildlife) under the industrial site scenario is minimal, as bird and small mammal use of the area is minimized by the compacted nature of the asphalt or compact soil and the gravel covering the subsurface soil (making it less accessible for burrowing and foraging), the lack of plant cover in the area (making less shelter and other habitat available), and the general industrial activity of human and vehicle traffic and noise that make the immediate area unlikely habitat for birds or small mammals; and.
- The potential for future on-site ecological risk will be eliminated by the proposed remediation alternative by removing the source of contamination on-site to below MTCA soil cleanup levels for unrestricted use.
- Two COPCs, PCBs and cadmium were not detected above their respective PQLs or MDLs in groundwater or the catch basin water sample. The PQLs and MDLs exceed National Water Quality Criteria but neither analyte was considered a COC.

5.6 Remedial Investigation Conclusions

5.6.1 Summary of Remedial Investigation

Review of the data and Site information gathered during the RI and from previous investigations identified several COCs related to petroleum products. The COCs were discovered to be associated with the East and Central Portions of the Site related to petroleum products. Areas identified with COCs above regulatory levels are presented in Figure 5-2. The following summarizes the principal issues identified by the RI.

- Diesel through oil petroleum hydrocarbons are considered COCs for soil on the East (near MW-11) and Central Portions of the Site. Gasoline range petroleum hydrocarbons, xylenes and lead are considered COCs for some soils on the Central Portion of the Site;
- No COCs were identified for site groundwater except diesel through oil range petroleum hydrocarbons on the East Portion of the Site in the vicinity of MW-11;
- No COCs were identified for soil or groundwater on the West Portion of the Site;
- There was no off-site migration of COCs identified during the RI;
- There is no current exposure to off-site terrestrial ecological concerns including the adjacent wetlands.

5.6.2 Uncertainties Associated with the Data and Cleanup Criteria

The following uncertainties impact the quality of the data collected during the RI field activities. It is discussed here to describe its impact on the state of knowledge of soil and groundwater conditions onsite. However, none of these uncertainties create conditions where data was rejected or excluded from the RI/FS evaluation. They are discussed in this section for informational purposes only.

Arsenic was detected in groundwater samples across the Site at concentrations ranging from 4.3 µg/L to 11 µg/L. There was relatively little variation in the concentration of arsenic detected in groundwater samples collected on-site, which is not indicative of a source of arsenic other than from ubiquitous area background levels in the Site soils. However, the concentrations of arsenic detected in Site groundwater samples are generally above the MTCA Method A groundwater standard of 5 µg/L. Arsenic has been identified as naturally occurring in both soil and groundwater throughout eastern Washington.

WAC 173-340-709 provides a method for defining background concentrations for a constituent based on statistical analysis. WAC 173-340-709(3)(a) states that "for lognormally distributed data sets, background shall be defined as the true upper 90th percentile or four times the true 50th percentile whichever is lower". The background concentration of arsenic was determined based on the concentration of arsenic detected in groundwater samples collected from MW-02 and MW-15 as agreed to by Ecology (September 10, 2003 conference call).

The concentration of arsenic detected in groundwater samples collected on September 25, 2003 and December 9, 2003 from MW-02 (6.4 µg/L and 5.2 µg/L, respectively) and MW-15 (9.1 µg/L and 8.5 µg/L, respectively) were used to determine the true upper 90th and 50th percentile of arsenic in accordance with WAC 173-340-709. The true upper 90th and 50th percentiles of arsenic were calculated using the methods outlined in "Washington State Department of Ecology Toxics Cleanup Program Statistical Guidance for Ecology Site Managers" (Ecology 1992). Based on the assumption that the data are lognormally distributed, the 90th percentile of arsenic was determined to be 9.9 µg/L

and four times the 50th percentile (7.12 µg/L) was determined to be 28.5 µg/L. The assumption that the data are lognormally distributed was not disproved using the "W Test" as outlined in the Ecology (1992) Statistical Guidance Document. Therefore, the calculated area background concentration and cleanup criterion for groundwater to be used for arsenic at the Site is 9.9 µg/L. The statistical background calculation sheet is provided in Appendix A-1.

In situations where the cleanup levels are less than natural (area) background concentrations, WAC 173-340-700(6)(d) allows for the cleanup levels to be established at the background concentration. Given the fact that arsenic is a soluble metal that is commonly found in natural soils in Eastern Washington (Ecology, 1994), applying the background concentration as the cleanup levels is appropriate for the Site.

Soil samples submitted to the analytical laboratory from the West Portion of the Site were analyzed for RCRA metals by EPA Method 6010 in accordance with the Quality Assurance Project Plan (Appendix B of the RI/FS Work Plan). None of the metals were detected above their MTCA cleanup levels. However, the PQL for selenium was above the Ecological Concerns cleanup criteria of 0.8 mg/kg. The RI results indicate that the constituents impacting the Site are all related to petroleum releases. There is no process knowledge that indicates a release occurring on–site would lead to elevated levels of selenium. In addition, there were no other constituents reported above cleanup criteria on this portion of the Site that would indicate that any release of hazardous substances has occurred. Therefore, using the MTCA Method B concentration is appropriate for this Site.

Groundwater and catch basin water samples submitted to the analytical laboratory from the West Portion of the Site were analyzed for RCRA metals by EPA Method 6010 in accordance with the Quality Assurance Project Plan (Appendix B of the RI/FS Work Plan). None of the metals were detected above their PQLs except arsenic. However, the PQL (4.4 µg/L) for cadmium and the MDL (0.56 µg/L) were above the National Water Quality Criteria (0.25 µg/L). The cadmium MDL is only slightly above the National Water Quality Criteria. In addition, the RI data indicate that the constituents impacting the Site are all related to petroleum releases. There is no process knowledge indicating that a release occurring on–site would lead to elevated levels of the metals. In addition, there were no other constituents reported above cleanup criteria on this portion of the site that would indicate that any release of hazardous substances has occurred. Therefore, cadmium is not considered as COCs for the Site. The RI data indicates the COCs are not migrating with groundwater and more specifically are not migrating off-site and impacting adjacent wetlands for which the National Water Quality Criteria apply.

Similar conditions exist for PCBs analyzed for groundwater and catch basin samples on the East, Central and West Portions of the Site as the three RCRA metals. PCBs were not detected in any groundwater or water samples on Site. However, the PQLs for PCB analyses were above the National Water Quality Criteria (0.014 µg/L). The PQL for PCBs ranged from 0.047 to 0.048 µg/L, which is essentially the lowest reasonably achievable levels using standard analytical methods. WAC 173-340-707 states that "The Department recognizes that there may be situations where a hazardous substances is not detected or is detected at a concentration below the practical quantitation limit utilizing sampling and analytical procedures which comply with the requirements of WAC 173-340-830. If those situations arise and the practical quantitation limit is higher than the cleanup level for that substance, the cleanup level shall be considered to have been attained", which is subject to subsection (4) of the Section. The Site historical information, process knowledge and analytical data also indicate that the only substantial release(s) to occur on-site are associated petroleum releases. These analytes were therefore not considered as COCs.

The following section provides a description of laws and governmental regulations that apply to the chemical contamination found at the Moses Lake Maintenance Facility Site. It provides a context for developing cleanup standards in subsequent sections.